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name *Apterodon gaudryi*.—Dr. H. G. Seeley has recently re-examined the vertebrate fossils found at Neue Welt, near Vienna, and has made a number of important rectifications in the determinations.

GEOGRAPHY AND TRAVELS.¹

THE OGOWÉ AND CONGO ROUTES TO STANLEY POOL.—The Royal Geographical Society's Proceedings, for August, gives some interesting details concerning M. de Brazza's expedition up the Ogowé. The ulterior object of this expedition was to open a route from the Ogowé to the Congo above the cataracts, and launch steam vessels on the navigable part of the latter stream. "The station founded at Ntamo [Stanley Pool] is intended as the starting point of the steam vessels which are shortly to be placed on the Congo, while that on the Passa affluent of the Upper Ogowé is the nearest point to the Congo which could be placed in direct communication by water with the Atlantic Ocean, some 435 miles distant. On his first expedition it took M. de Brazza two whole years to reach the Passa, which was previously unknown, and the obstacles to free commercial intercourse on the Ogowé were great, as the river was divided into three distinct sections, held respectively by the Inenga and Galoa tribes, the Okandas, and lastly the Adumas, each of whom exercised absolute control over their own section, so that three changes of porters and canoes were necessary, and the value of merchandise was thus enormously enhanced. But during his last journey M. de Brazza put an end to this arrangement which had existed from time immemorial, and made the navigation of the river free as far as Franceville, his station on the Passa. With regard to the 180 miles of land journey thence to Ntamo on the Congo, porters will be found as easily along the road as on the banks of the Ogowé, for the population is very dense and peaceable, and the surface of the country presents no serious difficulty; indeed were it not for some obstacles in the first three days' march, a wheeled vehicle might pass along the road without any preliminary labor being necessary. The country, moreover, is very healthy, as it consists of a plateau at an elevation of 2625 feet, and this altitude affects the vegetation beneficially, so that the banana and maize flourish there. But this line of land communication from one station to another is only a provisional expedient, for the route to be used in the future will touch the Congo at a point much nearer to Franceville. This route, by which the steam vessels will pass down to the Congo, is the river Alima, which in his former expedition M. de Brazza discovered at a point only forty-five miles from the Ogowé. The tract of country between Franceville and this point on the Alima is not difficult and, indeed, is almost practicable for laden wagons without any previous labor being

¹ Edited by ELLIS H. YARNALL, Philadelphia.

expended on it. Having traversed it five times already, M. de Brazza is able to speak confidently on the subject. The country is not wooded and the vegetation is sparse, the hills have a gentle slope and a wheeled vehicle could pass everywhere."

"M de Brazza justly prides himself on having been able to accomplish, without violence of any sort, the total abolition of the slave trade in the basin of the Ogowé. Franceville has already become a place of refuge for escaped slaves, and M. de Brazza states that all the tribes along the river recognize this right of asylum and admit that all slaves who place themselves under his protection are thereby made free." He speaks discouragingly of Mr. Stanley's operations, believing that his road on the north bank of the Congo will never become a practicable highway. "In a former geological age an immense plateau, at an elevation of more than 2000 feet above the level of the sea, separated the Upper Congo from the Atlantic; the river wore a bed for itself through this plateau, which at last, by the action of constant and continuous drainage, became furrowed into as many valleys as there were torrents rushing down into the great river. In following the line of the Congo, therefore, it becomes necessary to cross all these chains of mountains, which are the remains of the ancient plateau." * * * * "By the line of the Ogowé, the river is made use of as far as it is navigable for canoes, from which point it is but forty or forty five miles through an easy country to a point where the Alima is navigable for steam vessels. On this line, too, labor and provisions are drawn from the country itself, while on the Congo nothing but rocks and dry grass are to be found. Not only are the men of Mr. Stanley's expedition fed on rice from Europe transported on the backs of porters and mules, but the animals themselves are fed on hay and oats obtained from Europe at heavy cost." Mr. Stanley is compelled to obtain men from Zanzibar, but few of the natives being willing to work, while "at Franceville, on the other hand, the neighboring villages sent men to build the houses, and when M. de Brazza, in July of last year, had to send down the coast for supplies, the 750 Adumas who manned the canoes were only accompanied by one European and two Gaboon men. The natives here are paid in goods after working for three or six months. Sufficient labor could be procured on the spot to carry out any works between Franceville and the coast as well as between the Ogowé and the Alima, and this essential difference between the two routes is due to the Ogowé region being well peopled and the country fertile and new to European merchandise."

The French Government has organized another expedition, supplied with steam launches, to ascend the Ogowé to assist M. de Brazza, which, at last advices, had arrived on the coast.

THE GREAT ANDES OF THE EQUATOR.—Mr. Edward Whymper has recently read a most interesting account of his journey in Ecuador before the Royal Geographical Society. It is given in full in the Proceedings for August. We have space here for only two extracts, the first relating to one of the principal objects of his journey; the comparison of the working of aneroid against mercurial barometers at great elevations, and also the value of calculations based on the boiling point of water; and the second regarding the glaciers of the Ecuadorian Andes. To test the value of the aneroid barometer, Mr. Whymper took with him eight instruments carefully selected, after a trial of twelve months, from a number of others.

“Upon leaving England they were well together, the greatest difference between them being about the eighth of an inch, or more exactly, .13. The value of this difference at the level of the sea amounts to about 100 feet; and if the mean of the whole had been taken, there would have been an infinitesimal difference between it and the reading of a standard mercurial. But by the time I arrived at Guayaquil this difference had increased to .35; on arrival at Guaranda [8900] it had still further risen to .74; at our first camp on Chimborazo [14,300] it had mounted to .88, and at our third camp [17,200] to 1.2 inch. These were the differences of those which held closest together, rejecting those which had clearly gone mad. They differed amongst each other at starting to the extent of 100 feet, and by the time we had risen to 17,000 feet, this difference had increased to about *two thousand* feet. If you consider that these were not aneroids selected at random, but were the pick of a number which had been expressly constructed for the journey, I think you will feel that this experiment conclusively demonstrated the uselessness of expecting to obtain absolute determinations of altitude from any number of aneroids; and, expensive as the experience was, I do not consider it dearly gained, as it decided that matter so far as I desire to pursue it, for once and all. The best of all ways to settle whether altitudes can be deduced with accuracy from the indications afforded by the boiling-point of water, would of course be to conduct a series of experiments on the boiling-point at positions the height of which had been determined with scrupulous accuracy trigonometrically; but the opportunities of doing this at great elevations are not numerous, and such experiments can be performed at heights exceeding 16,000 feet in India alone. The next best way is to compare them against the mercurial barometer and, as we had mercurials almost always with us, I took the opportunity to make experiments, with the result of finding that the boiling-point observations consistently yielded lower altitudes than the mercurial barometer, and I quote in illustration three of the highest stations at which water was boiled, namely, the summits of Cotopaxi, Antisana and Cayambe:

The elevation of Cotopaxi by merc. bar. was.....	19,650
“ “ “ boiling water.....	19,090
“ “ Antisana by merc. bar.....	19,335
“ “ “ boiling water.....	18,714
“ “ Cayambe by merc. bar.....	19,200
“ “ “ boiling water.....	18,600”

Of the glaciers he remarks: “As travelers of eminence have visited and published works upon this region, it is surprising to find that complete ignorance exists respecting its glaciers, yet that there is complete ignorance is evident from the statement made in the recently published article on Ecuador in the ‘Encyclopedia Britannica,’ in which it says that ‘the crater of Altar, surrounded by a steep and jagged wall of rocks, is remarkable as the bed of the only real glacier known to exist in the Ecuadorian Andes.’ I found on Altar larger glaciers *outside* the crater than that which was *inside* it; and I found others of large size upon Carihuairazo, Illiniza, Cotacachi, Sincholagua, Quilindaña, Cotopaxi, Cayambe, Sara-urcu, Antisana and Chimborazo.”

There is little difference in general features in these equatorial glaciers from those of Europe. The Ecuadorian never descend so low as 12,000 feet, “and they generally terminate between 14,000 and 15,000 feet. Moraines are scarce upon them, for the reason that few rocks rise above them and the evidences which moraines frequently afford of former great extensions of glaciers is consequently wanting. *Roches moutonnées* are rare, more perhaps on account of the ease with which most of the rocks disintegrate than from any other cause. On the south side of Chimborazo, in a valley in which there is now no glacier at all, was the only place in which I was certain of *roches moutonnées*, but this single instance proved that glaciers on that mountain have formerly extended lower down than they do now. It may be stated, as a general rule, that crevasses in the lower parts of the Ecuadorian Andes are both smaller and less numerous than in corresponding situations in the Alps, and this I take to be an indication that in the inferior parts of these glaciers the rate of motion is less rapid than in the Alps. But in the higher regions they are frequently of enormous size, and we never anywhere had seen greater—if indeed so large—crevasses as we encountered on the upper part of Antisana, where some were at least from one-fourth to one-third mile long, 300 feet deep, and 50 to 60 feet across.

“Upon the whole I think that the glaciers are least extensive on the *western* sides of the mountains which have been enumerated, but I speak on this point with some hesitation, as I have not in several cases seen completely around them. It is only what might be expected in a country where vapor-laden easterly wind so largely preponderates. True east wind is, however, rare in comparison with north-east and south-east, which outweigh all the rest. Charged with vapor from the Amazonian cauldron,

these winds are almost ceaselessly blowing against the opposing sides of the Great Andes and depositing their moisture in the form of fine snow or hail. In the frequency with which it will be remarked that our ascents were made from the west, there is an illustration of our frequent inability to see anything through the clouds which enveloped the other sides. In *force* the winds were not remarkable."

GEOGRAPHICAL NEWS.—At a recent meeting of the Paris Geographical Society a letter from M. Rabot, now travelling in Norway, was read, which stated that the last two winters, "though very rigorous, have not had any great influence on the opening or closing of the passages because the summers have been remarkably warm. This year, on the other hand, navigation will be stopped very early, as the summer is reported to be a very cold one in the extreme north. M. Broek, formerly a minister of the Norwegian Government, thought there was confirmation of his expectations in the fact that vast numbers of birds, driven out by the rigor of the climate, are now alighting on the shores of Norway. They are arriving in such a state of starvation that they swallow the bait whilst the fishermen are casting their lines." —Three English gentlemen, Messrs. Delmar Morgan, Peek and Coles, have undertaken an exploration of the east-central and south-east portions of Iceland this summer. They take with them a valuable set of scientific instruments loaned by the Royal Geographical Society. —The *Willem Barents* of the Dutch North Polar Expedition, has not been able to reach Spitzbergen this year. She found the ice extended in a compact mass from 68° 30' N. lat. and 6° W. long. to 73° 30' N. lat. and 14° E. long., some twelve geographical miles north of Vardö. There was ice also thirty miles south of Bear Island.—The steamer *Oscar Dickson* was frozen in at the mouth of the Yenisei River in 72° N. lat. and between 76° and 77° E. long. during the last winter. The winter was passed without serious disaster. The sun was below the horizon for seventy days and the cold rose to -41° C. Enormous masses of snow fell during March and April, covering the ice a height of seven feet above the ship's deck. The ice was seven and a half feet thick.—A partial survey was made last year by Commander Boulton, R.N., of the southern portion of Hudson's Straits and the exact position of many headlands and islands ascertained. During August ice formed at night. Between Koksoak River, the extreme point reached, and Cape Chudleigh and thence also to Nachvak Bay [N. lat. 59], Eskimo are the sole inhabitants.—The last number of the Bulletin of the Berlin Geographical Society contains a paper on the Climate of the Glacial Period, by Dr. Woeikoff. For the formation of glaciers a certain amount of moisture in the atmosphere as well as a low temperature is necessary. In the Woznesensky gold mine, at a height of 920 meters, the mean temperature is -90

Celsius, but the climate is rather dry and there are no glaciers. Dr. Woeikoff shows by examples that the difference of mean temperatures at the lower ends of glaciers reaches as much as fully 20° . Provided the quantity of rain and snow is great, glaciers descend as low as 212 meters above the sea-level, as in New Zealand, which has the latitude of Nice and the mean temperature of Vienna and Brussels. He also discusses the decided influence great masses of snow exert upon the temperature of a country.—Dr. Kirk, the English Consul-general at Zanzibar is preparing a work on the tsetse fly.—The Portuguese propose to establish four great stations in Central Africa from which the exploration of the surrounding districts can be carried on.—The missionaries at the University's Mission Station at Masasi, state that the River Lujenda is believed to rise from a great lake east of Nyassa, and it is probable that a good sized lake still remains to be discovered to the north or north-east of Shirwa.—The Italian travelers Dr. P. Matteucci and Lieut. Alfonso Massari reached Liverpool on August 5th, from a journey across Africa. They left Suakin, on the Red Sea, on March 5, 1880, and proceeded by way of Khartum and the province of Kordofan to El Fasher, the capital of Darfur. After wearisome negotiations they were allowed to go to Abeshr, the chief town of Wadai. They then visited Lake Chad, and after traversing Bornu, Baghirmi, Sokoto, &c., they arrived at Egga on June 8, 1881, and reached the Gulf of Guinea shortly afterwards. As the countries passed through are all more or less known, no great discoveries were made, though the travelers were the first Europeans to make the entire journey from the Red Sea to the Atlantic. Dr. Matteucci unfortunately succumbed to disease contracted during the journey, and died, after reaching London, on August 7th.—Mr. Thomson, the African traveler, has arrived at Zanzibar, having been employed by the Sultan to examine the mineralogy of the mainland and also to look for coal which is said to be found near the coast.—The new map of the United States, preparing under the direction of the U. S. Geological Survey, is on a scale of 1 : 250,000.—Dr. O. Finsch, the Polynesian traveler, arrived at Sydney from New Britain early in May last. During his visit of eight months in that island he made large collections, including 12,000 geological specimens. He now visits New Zealand, and goes afterwards to North Australia and thence to New Guinea, making careful observations of the character and habits of the natives of these regions.

MICROSCOPY.¹

EXAMINATION OF CARBON DIOXIDE IN THE FLUID CAVITIES OF MINERALS.—Mr. Alexis A. Julien thus describes the method employed in his investigations:

"The qualitative identification of carbon dioxide in the cavi-

¹ This department is edited by Dr. R. H. WARD, Troy, N. Y.